Agrotech Journal
ATJ
Url: http://usnsj.com/index.php/ATJ
Email: editor.atj@usnsj.com

Effect of the Treatment of Rice Seed Infected with *Xanthomonas oryzae pv. oryzae* On Growth and Yield of Rice in the Field

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ARTICLE INFO

ISSN: 2548-5121
Vol. 2, No. 2, November 2017
URL:http://usnsj.com/index.php/ATJ/article/view/2.2,54-62

Abstract

This research aimed to study the effect of treatment of rice seed infected with *X. oryzae pv. Oryzae* naturally to control bacterial leaf blight and to increase growth and yield of rice in the field. The research used Slit plot design with the main plot of variety consisting of *IR64* and *Ciherang*, while the subplot is a seed treatment consisting of control, bactericide 0.2% (Agrept 20WP), 1% citronella oil, biological agent *Pseudomonas diminuta* (McFarland IV scale), matriconditioning + Agrept 0.2%, matriconditioning + 1% citronella oil, and matriconditioning + *P. diminuta*. Although seed treatment has not been able to control the bacterial leaf blight, it can increase the growth of seed and yield. Treatment of matriconditioning + Agrept 0.2% can increase the seed viability and dry weight of seedlings. Height of seedlings can be increased by the treatment of citronella oil, biological agents *P. diminuta*, matriconditioning + agrept 0.2%, and matriconditioning + 1% citronella oil. Treatment of citronella oil, matriconditioning + *P. diminuta*, biological agents *P. diminuta*, and matriconditioning + Agrept 0.2% can increase the estimated yield of *ubinan*/CCE harvest.

Keywords: biological agents, bactericide, bacterial leaf blight, matriconditioning, citronella oil, seed treatment

A. Introduction

Rice productivity tends to be patterned slope. This is due to many factors, one of which is the high attack of disease in rice. The extent attack of *kresek* disease/bacterial leaf blight (BLB) in 2007 reached 50,519 hectares and 12 hectares of them suffered *puso*/did not produce yield (Directorate of Crop Protection, 2009). BLB disease is caused by the bacteria *Xanthomonas oryzae pv. Oryzae,* in which affect the loss of rice yields in Japan with amount of 20-30%, in Indonesia the magnitude of yield loss is almost the same or may be larger than in Japan (Ou, 1985). *Xanthomonas oryzae pv. Oryzae* is a pathogen carried by seeds in rice (Sutakaria,1984).

BLB control can be one solution to increase rice productivity, in which the control can be done from the preparation of seeds by controlling the pathogen carried by seeds. This is done because the pathogen carried by seed *X. oryzae pv. Oryzae* correlates with the attack of BLB disease in the field (BBPPMBTPH, 2007).

Control of pathogen carried by seed can be done by seed treatment by using synthetic pesticides, bio pesticides, and biological agents. According to Ilyas *et al.* (2008b), the Agrept treatment on rice seeds with a concentration of 0.2% showed the higher seed viability and vigor indexes than other concentrations. Otherways, treatment of citronella oil with a concentration of 1% produces the higher seed viability, vigor index, and growth rate than other concentrations. On the other hand, the biological agent code A6 (*Pseudomonas sp*.) has the potential as an effective biological agent to control *X. oryzae pv oryzae* on rice seed.

Control of the pathogen carried by the seed should also be combined with the improved physiological quality of the seed. This is because in general, the seeds attacked by pathogens will experience a faster decline in quality. On the other hand, improvement of seed physiological quality can be performed by invigoration, an artificial technique to the enhanced the seed vigor through controlled metabolic processes that can repair the seeds damage.

One of the invigorating treatments is matriconditioning, which is in chili seeds can increase the appearance of seedlings planted in the soil with a quite low temperature (Ilyas, 1994). According to Ilyas et al. (2008a), matriconditioning plus *Bacillus subtilis* in rice seed yielded the good seedling growth and decreased the percentage of *X. oryzae pv oryzae* better than other treatments tested. Treatment of matriconditioning plus 1% citronella oil yielded the highest seed viability, increased vigor index, and decreased the infection rate of *X. oryzae pv oryzae*.

Control of *X. oryzae pv. Oryzae* starting from the stages of seed preparation is expected to improve the quality of seed health, while the invigoration treatment is expected to improve the physiological quality of the seed. Furthermore, the improvement of seed quality is expected to increase growth and yield of rice in the field.

This research aimed to study the effect of natural treatment of rice seed infected with X. *oryzae pv. Oryzae* to control bacterial leaf blight and to increase growth and yield in the field.

B. Methodology

1. Time and Place

This research was conducted from January to June 2009 at Seed Science and Technology Laboratory, Department of Agronomy and Horticulture, Bogor Agricultural University (IPB) and Rice Field Experiment Park, University Farm, Dramaga campus, IPB.

2. Method

Rice Seed

Rice seed variety *IR64* and *Ciherang* used are derived from *ICRR* Sukamandi with the quality grade of Breeder Seed. Prior to use, the seeds were stored in plastic packaging and placed in a room with a constant temperature of 16 ^{0}C at the Agricultural and Seed Saving Laboratory of Department of Agronomy and Horticulture of IPB for 2 months. Previously *IR64* and *Ciherang* seed varieties have also been retained for 3 months and 5 months at room temperature at the rice storage warehouse of ICRR Sukamandi. The health of rice seeds is tested for the presence of *X. oryzae pv. Oryzae* by the grinding method. The results showed that the rice seeds used were infected with *Xanthomonas oryzae pv. Oryzae* of 51 cfu on *IR64* and 40 cfu on *Ciherang*, naturally. Based on the physiological quality test, *IR64* rice seeds used had 92.5% seed viability and 89.5% vigor index, while *Ciherang* seeds had 91% seed viability and 90% vigor index.

3. Research Design

This study used the Slit plot design with the main plot of the varieties consisting of *IR64* and *Ciherang*, while the subplot is a seed treatment consisting of control (P0), bactericide 0.2% (Agrept 20WP) (P1), 1% citronella oil (P2), biological agent *Pseudomonas diminuta* (P3), matriconditioning + Agrept 0.2% (P4), matriconditioning + 1% citronella oil (P5), matriconditioning + *P. diminuta* (P6). Repetition is three times so that the total experimental

unit amounted to 42 units. If there is a significant effect of treatment on the analysis of variance (95% confidence level), further test with DMRT is done.

4. Seed Treatment

- Control: Without seed treatment.
- Bactericide: bactericide solution (Agrept 0.2%) 12.72 ml is used to moisten 10.6 grams of seed
- Citronella oil: 12.72 ml of citronella oil solution (1%) mixed with Tween 80 (4 drops ≈ 4 ml) was used to moisten 10.6 grams of seed.
- Biological agents: 10.6 grams of seeds moistened with 12.72 ml of biological agent solution (scale IV McFarland ≈ 4.5 x 108 cfu.L^{-1} (Kiraly Z. et al., 1994).
- Matriconditioning + Agrept 0.2% : 10.6 grams of seeds moistened with 12.72 ml bactericidal Agrept 0.2% then mixed with 8.48 grams of charcoal husk until evenly covered the seeds.
- Matriconditioning + citronella oil: 10.6 grams of seeds moistened with 12.72 ml of moisturizing solution (citronella oil 1% + Tween 80) then mixed with 8.48 grams of husk charcoal until evenly covered the seeds.
- Matriconditioning + *P. diminuta*: 10.6 grams of seeds moistened with 12.72 ml of *P. diminuta* solution then mixed with 8.48 grams of husk charcoal until evenly covered the seeds.
- All seed treatment is carried out in transparent bottles at 20 ° C, stirred every 12 hours to 30 hours of treatment duration. Each treatment in each tested varieties was repeated three times.

5. Land Preparation

This research was conducted in Babakan Darmaga garden on Latosol soil at 250 m asl. Land used is wet land last season which Irrigated with non-technical irrigation system.

The land preparation began by leveling the straw which is then immersed and left to rot for 2 weeks. Furthermore, the land was plowed to level the land. Then the soil was allowed to mud up to a week. After that, the land was divided into plots sized 3 m x 2.5 m.

6. Seedlings, Planting, and Plant Maintenance

Seedlings are carried out on a plastic bag by using mud. The time of seeding is 3 weeks. Planting was done at 3 weeks after seedling (WAS) with a spacing of 25 cm x 25 cm. The number of seedlings per planting hole is two seeds. Stitching was done no later than 2 weeks after planting (WAS). Weeding was carried out when weeds have affected plant growth.

Control of plant pest organism (OPT) chemically was not done. Control was only done on weeds with manual technical culture intensively.

Irrigation, at planting time - 3 weeks after planting (WAP): Tracemaking; 4-10 (WAP): watered as high as 2-5 cm; 11 WAP-primordia flowering: watered with 5 cm and allowed to dry by itself, then watered back (repeatedly); Flowering phase-10 days before harvest time (HSP): continuously watered as high as 5 cm; 10 HSP to harvest time: plot is dry. Application of manure with a dose of 5 tons/ha was done in the land preparation. Application of 200 kg/ha Urea is divided three times ie at 3 WAP, 6 WAP and primordia flowering time. Application of 200 kg/ha SP-18 and 200 kg/ha KCl was only done at 3 WAP.

7. Observation

Plant Growth

- Percentage of seedlings growth (viability) was done at 3 WAS.
- The dry weight of seedling was measured at 3 WAS. Seedlings sample was placed in oven at a temperature of 60 0C for 3 x 24 hours.
- Number of tillers: calculated on 6, 7, 8, 9, 10 WAS and harvest time.
- The dry weight of the stover was measured after harvest time by stirring at 60 ° C for 3 x 24 hours.
- Plant height measured from ground level at 1, 2, 3, 6, 7, 8, 9, 10 WAS. At harvest time, the plant height was measured from the ground to the tip of the longest panicle.

Bacterial Leaf Blight Attack

Bacterial leaf blight attacks were observed in intensity (%) at 11, 12, 13 WAS and at harvest time.

Production component and Yield

Observations were made at harvest of five sample plants per experimental unit.

- Productive tiller.
- *Ubinan* (crop cutting experiments =CCE) were done at the harvest time by harvesting an area of 3 x m2 from the rice plant without the plants on the edge.

- Number of panicles per clump.
- The number of pithy grain per panicle was calculated by taking one random panicle from each plant sample.
- The number of empty grain per panicle was calculated by taking one random panicle from each plant sample.
- The weight of pithy grain per panicle was measured by weighing the pithy grain taken from panicle which was used to the variable of number of pithy grain per panicle.
- The percentage of pithy grains per clump was calculated by knocking out all the panicles in a clump and calculating the percentage of the pithy grain.
- The percentage of empty grains per clump was calculated by threshing all the panicles in one clump and calculating the percentage of empty grain.

C. Result and Discussion

1. General Condition

The most common pests that attack the rice are the *Keong mas*/golden snail (*Pomacea canaliculata*), grasshoppers, Rice Ear Bug (*Leptocorisa oratorius)*, and birds. The golden snail attacked the rice (young rice) by scratching the plant tissue and eating it (Hasanuddin, 2003), while Grasshoppers attacked the rice by eating plant leaves, while Rice Ear Bug (*Leptocorisa oratorius)* attacked by sucking liquid in young grains of rice. Birds attack the almost ripe plants by eating the grains of ripe rice.

2. Plant Growth

Plant Height

The effect of seed treatment at week 1 and 2 indicated that the treatment of matriconditioning + Agrept 0.2% (P4) resulted in the highest plant height compared to other treatments. The control showed the lowest plant height at week 1 and 2 compared to other treatments. At week 3, the treatment of citronella oil, biological agents, matriconditioning + Agrept 0.2% , and matriconditioning + citronella oil resulted in higher plant height than other treatments (Table 1). Furthermore the control still show the lowest plant height compared to other treatments.

Different findings occurred at the 6 week until harvest, all the tested seed treatment showed no significant effect on plant height. The control resulted in the lowest plant height since the seedling time until harvest time, however, it indicated that the plant height is not significantly different with other treatments. This is might be due to the effect of growth stagnation or seed treatment that only affects in the seedling phase.

Table 1. Effect of seed treatments on plant height

Treatment	Plant height (cm) at week –*th*								
	1	**2**	**3**	**6**	**7**	**8**	**9**	**10**	**Harvest**
P0	6.7 e	17.7d	26.0 b	43.9	56.5	64.3	74.9	83.4	108.4
P1	12.4 b	21.6c	26.1 b	44.2	53.5	61.6	73.1	81.8	106.7
P2	9.4 d	22.0bc	**28.2 a**	43.9	55.7	65.5	75.7	84.0	109.0
P3	11.2 c	22.5bc	**28.0 a**	44.3	55.6	63.9	75.1	85.6	108.2
P4	**14.2 a**	**24.0a**	**27.9 a**	41.9	53.6	62.4	74.3	83.3	107.5
P5	9.9 d	22.8b	**27.4 a**	43.2	54.3	63.3	74.8	84.0	108.4
P6	13.2ab	22.6bc	26.9ab	43.1	55.1	64.4	76.1	84.3	110.7

Note: P0 = control, P1 = bactericide, P2 = citronella oil, P3 = biological agent, P4 = matriconditioning + Agrept 0.2%, P5 = matriconditioning + citronella oil, P6 = matriconditioning + *P. diminuta*. The average value followed by the same letter in the same column indicates no significant difference based on the DMRT test at α = 0.05.

Table 2. Effect of varieties on plant height

Varieties	Plant Height (cm) at week –*th*								
	1	**2**	**3**	**6**	**7**	**8**	**9**	**10**	**P**
Ciherang	**11.7a**	**22.4a**	27.4	42.7b	54.3	63.8	74.9	83.6	109.6
IR-64	10.3b	21.3b	27.1	**44.3a**	55.5	63.5	74.8	83.9	107.2

Note: The mean value followed by the same letter in the same column indicates no significant difference based on the DMRT test at α = 0.05.

The effect of varieties at week 1 and 2 showed that *Ciherang* has a higher plant height than *IR64*. At week 3, the plant height of both varieties were not significantly different. However, at week 6 the *IR64* varieties were higher than Ciherang. According to ICRR-*BB padi* (2007), *IR64* has higher plant height than *Ciherang*.

Table 3. Effect of interaction between seed treatment and varieties on plant height at week 6

Varieties	Seed Treatment						
	P0	P1	P2	P3	P4	P5	P6
IR64	42.9 ab	**45.6 a**	**45.7 a**	**43.9 a**	**45.3 a**	**44.3 a**	42.4 ab
Ciherang	**45.0 a**	42.8 ab	42.0 ab	**44.7 a**	38.5 b	42.0 ab	**43.9 a**

Note: the details are the same as in Table 1.

Table 4. Effect of interaction between seed treatment and varieties on plant height at week 10

Varieties	Seed Treatment						
	P0	P1	P2	P3	P4	P5	P6
IR64	85.9ab	83.4 abc	84.2 abc	85.6 abc	83.4 abc	84.9 abc	80.3 c
Ciherang	81.0bc	80.2 c	83.8 abc	85.6 abc	83.2 abc	83.1 abc	**88.3 a**

Note: the details are the same as in Table 1.

The interaction between varieties and seed treatment only found in a certain week indicated that the interaction had not a significant impact on overall plant development (Tables 3 & 5). The interaction at 6th week showed a trend that was not the same as the interaction at week 10. The matriconditioning treatment + *P. diminuta* (P6) in *Ciherang* was one of the interactions that increased plant height at week 6. However, at week 10, only the interaction of *Ciherang* + P6 treatment obtained the highest plant height. This suggested that the use of biological agents is quite good as they will continue to interact as long as the biological agents continue to live and grow.

Viability, Dry weight of Seeds, and Dry Weight of Stover

The variable of the seed viability indicated that the varieties treatment had no significant effect, seed treatment has a very significant effect, and the interaction between the treatments has no significant effect.

The best seed treatment to increase the seed viability was matriconditioning + Agrept 0.2% (Table 5). This is might be due to the effect of the good combination of solvents and matriconditioning media. Matriconditioning media should be able to form a rhizosphere around the seed that is capable of delivering the solvent into the seed (Khan et al., 1990). Treatment of matriconditioning + citronella oil and matriconditioning + *P. diminuta* which is also a treatment of matriconditioning showed not better result than matriconditioning + Agrept 0.2% . Chemical treatments (Vitavax, Thiram, and Mancozeb) on rice seeds were also reported to maintain the viability of seeds ≥ 80% despite have been stored for six months (Nghiep & Gaur, 2005).

Table 5. Effect of seed treatment on seed viability, dry weight of seedlings and dry weight of Stover

Treatment	Seed viability (%)	Dry weight of seed (mg)	Dry weight of Stover (g)
P0	77.5 c	31.833 d	65.345
P1	83.3 bc	39.500 cd	72.028
P2	75.0 c	44.500 bc	62.250
P3	80.8 bc	50.833 ab	71.117
P4	**94.1 a**	**57.167 a**	72.811
P5	80.8 bc	49.167 ab	75.511
P6	87.5 ab	51.000 ab	76.983

Note: the details are the same as in Table 1

The seed treatment with the lowest seedling viability was the treatment of citronella oil (P2) and control (P0). P2 had a low viability probably due to the low solubility of citronella oil so that is less absorbed by the seed. According to Untari (2003), there is a tendency that the higher concentrations of clove oil and the longer incubation time performed on pepper seeds will lead to an increase in T_{50}

The lack of solvent absorption (citronella oil) by the seed caused the effect of conditioning through immersion was less than maximum.

The effect of varieties is not significant on the dry weight of seed. However, the effect of treatment is very significant, whereas the interaction between the treatment had no significant effect. In this variables, the best seed treatment is matriconditioning + Agrept 0.2%. It is might be caused by the combination of matriconditioning with bactericide is the best treatment compared to other treatments so that seedling growth is faster. Moreover, the control showed the lightest weight of the seedlings.

Table 6. Effect of varieties on number of tiller

Treatment	Number of –*th* Tiller					
	6	7	8	9	10	Panen
Ciherang	12.886	20.324 b	23.829 b	26.124 b	25.143 b	19.2571 b
IR-64	15.267	**25.010 a**	**27.895 a**	**30.743 a**	**28.581 a**	**21.3810 a**

Note: The mean value followed by the same letter in the same column indicates no significant difference based on the DMRT test at α = 0.05.

Number of Tiller

Varieties have a very significant effect on 7-10 weeks and at harvest time. Seed treatment and interaction between varieties and seed treatment had no significant effect. The effect of varieties at 7-10 weeks and at harvest showed a similarity that IR64 has more numerous number of tillers than Ciherang (Table 6). This is might be caused by the genetic diversity of each variety. Genetically, IR64 has a greater number of tillers than Ciherang (BB padi, 2007)

Bacterial Leaf Blight

The coefficients of variation of BLB observation at week 11, 12, and 13 were high, that are 40.5, 30.4, and 30.8 respectively. This indicated that the incidence of BLB attacks in the field is still affected by uncontrolled environments. The factors and the tested interactions have not been effective to control BLB attacks in the field due to the difficult to control environment (especially the distribution of pathogens). At harvest time, the coefficient of variation decreased more that 11.5. This is might be caused by the growing phase of the plant had in mature phase so that the distribution of pathogens was low. The seed treatment that showed a tendency to decrease BLB attack at 11 WAS was matriconditioning + *P. diminuta*. However, at the harvest time, the treatment of matriconditioning + Agrept 0.2% tended to decrease BLB attacks (Table 7).

Table 7. Effect of seed treatment on bacterial leaf blight attack (%)

Treatment	11 WAP	12 WAP	13 WAP	Harvest
P0	3.700	4.233	4.300	12.200
P1	3.366	3.566	3.266	11.066
P2	2.433	3.000	2.866	11.333
P3	2.233	2.933	3.133	11.366
P4	2.366	3.066	3.233	**10.300**
P5	2.600	3.066	3.133	10.933
P6	**1.966**	3.100	2.933	11.066

Note: the details are the same as in Table 1.

Coefficient of variation (CV) at 11 WAP to harvest was: 40.5, 30.4, 30.8, dan 11.5 respectively. Ciherang varieties show a tendency to be more resistant to BLB attacks than IR64 (Table 8). This is might be affected by the genetic properties of Ciherang that are resistant to BLB strains III and IV, whereas IR64 was only slightly resistant to BLB strains IV (BB Padi, 2007).

Table 8. Effect of varieties on bacterial leaf blight attack (%)

Varieties	11 WAP	12 WAP	13 WAP	Harvest
IR 64	2.6286	3.3810	3.5143	11.1905
Ciherang	2.7048	3.1810	3.0190	11.1714

Note: The mean value followed by the same letter in the same column indicates no significant difference based on the DMRT test at α = 0.05.

3. Production Components and Yield

Productive tiller and the number of empty grain per panicle

Seed treatment had no significant effect on the number of productive tillers and the number of empty grains per panicle. Nevertheless, matriconditioning + *P. diminuta* treatment showed a tendency to produce more productive tillers than other treatments. Treatment of biological agents tended to result in the number of empty grains per panicle more than other treatments (Table 9).

Table 9. The effect of seed treatment on the number of productive tillers and the number of empty grains per panicle

Treatment	∑ productive tillers	∑ empty grains per panicle
P0	18.9	53.0
P1	20.0	55.2
P2	19.8	53.8
P3	20.7	**57.0**
P4	20.4	53.2
P5	20.7	51.6
P6	**21.5**	54.6

Note: the details are the same as in Table 1

Varieties had a significant effect on the number of productive tillers. IR64 had more productive tillers than Ciherang. This is probably caused by the genetic properties of IR64 that has more productive tillers than Ciherang (ICRR, 2007).

Tabel 10. The effect of Varieties on the number of productive tillers and the number of empty grains per panicle

Varieties	**∑ productive Tillers**	**∑Empty grains per panicle**
Ciherang	19.2 b	**63.3 a**
IR-64	**21.3 a**	44.8 b

Note: The mean value followed by the same letter in the same column indicates no significant difference based on the DMRT test at α = 0.05

Crop Cutting Experiment (CEC) Harvest/ ubinan harvest, percentage of pithy grain per clump, and Percentage of empty grain per clump

Seed treatment had a significant effect on CEC harvest. Treatment of citronella oil, matri conditioning + biological agents *P. diminuta*, , and matriconditioning + Agrept 0.2% yielded the highest CEC yield compared to other treatments (Table 11). citronella oil produced a high CEC yield probably due to the high percentage of pithy rice per clump (after matriconditioning + citronella oil), whereas the treatment of matriconditioning + *P. diminuta* had more productive tillers than other treatments. Treatment of biological agents increased the yield of CEC harvest reasonable caused by the number of productive tillers which close to that of matriconditioning + *P. diminuta* treatment. The low percentage of empty grain per clump and the lowest bacterial blight attack at harvest time were suspected to be the cause of the high yield of ± matriconditioning + Agrept 0.2% treatment.

Table 11. Effect of seed treatment on estimated yield of CEC harvest, percentage of pithy grain per clump, and percentage of empty grain per clump

Treatment	Yield of CEC/*ubinan* harvest (Kg)	% Pithy grain/ clump	% Empty grain/ clump
P0	1.2822 ab	82.273	17.727
P1	1.1302 b	82.119	17.881
P2	**1.4967 a**	86.635	13.365
P3	**1.3820 a**	84.865	15.135
P4	**1.3667 a**	85.884	14.116
P5	1.3007 ab	86.659	13.341
P6	**1.4585 a**	86.554	13.446

Note: the details are the same as in Table 1.

Seed treatment had no significant effect on the percentage of pithy grain per clump as well as the percentage of empty grain per clump. Nevertheless, the treatment of matriconditioning + citronella oil showed a tendency to produce a higher percentage of pithy grain per clump than other treatments. The control and bactericide treatment showed a tendency to produce a higher percentage of empty grain per clump than other treatments (Table 11).

IR64 produced a greater yield of CEC harvest than that of Ciherang. Based on descriptions of varieties, Ciherang produced a higher yield than IR64 (ICRR, 2007). This anomaly was caused by the percentage of empty grain per clump of the Ciherang variety was much greater than IR64 (Table 12) as well as a less percentage of pithy rice per clump than IR64. The high percentage of empty grains per hill this resulted in the loss of yield (ubinan harvest) in Ciherang. The high percentage of empty grain per clump in Ciherang is thought to be caused by a high attack of the pest.

Table 12. Effect of varieties on estimated yield of CEC harvest, percentage of pithy grain per clump, and percentage of empty grain per clump

Varieties	Yield of CEC/*ubinan* (Kg)	% Pithy grain/ clump	% Empty grain/ clump
Ciherang	1.28029 b	82.441 b	**17.559 a**
IR-64	**1.41024 a**	**87.556 a**	12.444 b

Note: The mean value followed by the same letter in the same column indicates no significant difference based on the DMRT test at $\alpha = 0.05$.

D. Conclusion

Matriconditioning + Agrept 0.2% is a seed treatment which is able to increase the percentage of viability, seedling height, and dry weight of seedlings. At the week 6 and 10, the treatment of matriconditioning + Agrept 0.2 % on seed rice variety *Ciherang* rice resulted in the highest plant height. Otherways, Treatment of citronella oil, matriconditioning + *P. diminuta*, biological agent *P. diminuta*, matriconditioning + Agrept 0.2% obtained the highest yield of ubinan harvest compared to other treatments. Varieties, seed treatment, and interaction between both treatments have no significant effect on bacterial leaf blight attack in the field.

E. Acknowledgment

The research was funded by the Ministry of Agriculture Republic of Indonesia through KKP3T program of 2009 implementation budget entitled 'Techniques to Improve the Health and Quality of Rice Seeds' number: 588 / LB.620 / I.1/ 3/2009, on February 20, 2009, chaired by Prof. Dr. Ir. Satriyas Ilyas.Therefore, we thank you.

F. References

BBPPMBTPH. 2007. Inventarisasi Data Patogen Tular Benih. Balai Besar Pengembangan Pengujian Mutu Benih Tanaman Pangan dan Hortikultura. Departemen Pertanian. Jakarta.

BB Padi. 2007. Deskripsi Varietas Padi. Balai Besar Penelitian Tanaman Padi. Sukamandi. 80 hal.

Direktorat Perlindungan Tanaman Pangan. 2009. Data Luas Serangan BLB/Kresek pada Tanaman Padi Tahun 2007. http://ditjentan.deptan.go.id. (accessed on February 26th 2009).

Hasanudin, A. 2003. Masalah Lapang Hama Penyakit Hara pada Padi. Balai Penelitian Tanaman Padi. Sukamandi. 72 hal.

Ilyas, S. 1994. Matriconditioning benih cabai (Capsicum annuum L.) untuk memperbaiki performansi benih. Keluarga Benih 5 (1): 59-67.

Ilyas, S., Amiyarsih, & T. S. Kadir. 2008[a]. Metode Uji dan Teknik Peningkatan Kesehatan Benih Padi [Makalah]. Di dalam Sinkronisasi Pengembangan Mutu Benih Balai Besar Pengembangan Pengujian Mutu Benih Tanaman Pangan dan Hortikultura; Banten, 26-28 Agustus 2008. Hal 1-16 (tidak dipublikasikan).

Ilyas, S., Sudarsono, U. S. Nugraha, T. S. Kadir, A. M. Yukti, & Y. Fiana. 2008[b]. Teknik Peningkatan Kesehatan dan Mutu Benih Padi. Laporan Hasil Penelitian. Institut Pertanian Bogor bekerjasama dengan Sekretariat Badan Penelitian dan Pengembangan Pertanian, Departemen Pertanian. Bogor. 40 hal.

Khan, A. A., H. Miura, J. Prusinski, & S. Ilyas. 1990. Matriconditioning of Seed to Improve Emergence. Proceeding of The Symposium on Stand Establishement of Horticultural Crops. Minnesota. p 19-40.

Kiraly Z., Z. Klement, F. Solymosy, & J. Voros. 1994. Methode in Plant Pathology. Elseveir Scientific Publishing.

Nghiep, HV. & A. Gaur. 2005. Efficacy of seed treatment in improving seed quality in rice. *Omonrice,* 13, 42-51.

Ou, SH. 1985. Rice Diseases. Commonwealth Mycological Institute. Farnham Royal, Slough SL2 3 BN, UK. 380 p.

Sutakaria, J. 1984. Penyakit Benih. Institut Pertanian Bogor. Bogor.

Untari, M. 2003. Pengaruh Perlakuan Minyak Cengkeh terhadap Tingkat Kontaminasi Cendawan Patogenik Tular-Benih *Colletotrichum capsici* (SYD.) Bult. Et Bisby dan Viabilitas Benih Cabai Merah (*Capsicum annuum* L.). Skripsi. Departemen Agronomi dan Hortikultura, Institut Pertanian Bogor. Bogor. 64 hal.